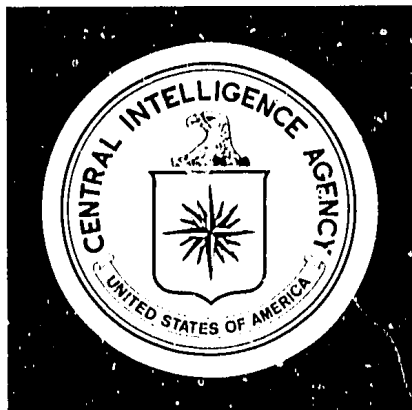


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Research Aid

The Soviet Grain Balance, 1960-73

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The Soviet Grain Balance, 1960-73

September 1975

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THE SOVIET GRAIN BALANCE, 1960-73

SUMMARY

The more than 75% increase in Soviet grain production since 1960 has been overmatched by the rising demand for grain, particularly for livestock feed. The result has been an unprecedented level of grain imports in recent years. Close examination of Soviet data permits a partial reconstruction of a grain balance—which draws together data on domestic production, net imports, and major components of consumption during 1960-73.

Sufficient data exist to make reliable estimates of Soviet use of grain for seed, food, industrial products, and net imports. Data on which to base estimates of grain fed to livestock—about two-fifths of all grain available in 1973—are much less satisfactory; these estimates are far less accurate than estimates for other uses.

The reconstruction of Soviet grain balances helps shed light on the size of Soviet grain stocks—a carefully guarded state secret. Because of uncertainties about (1) estimates of livestock feed, (2) the annual losses suffered through difference between official claims and actual usable output, and (3) the establishment of benchmark data, the estimates of stock levels can only be illustrative. Nevertheless, the trend in grain stocks contained in the grain balance in this report appears reasonably consistent with Soviet import decisions in 1960-73.

NOTE: This report was prepared by the Office of Economic Research, Central Intelligence Agency. Questions on the report should be addressed to the Director of Economic Research, Central Intelligence Agency, Washington, D.C. 20505.

USSR: Summary of Supply and Consumption of Grain¹

Million Metric Tons

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Supply.....	126.6	131.6	140.7	111.2	161.1	128.2	179.6	150.8	171.7	163.7	189.7	185.2	183.9	247.0
Domestic production ²	125.6	130.9	140.1	107.4	152.0	121.1	171.0	147.7	169.3	162.3	186.8	181.2	168.2	222.5
Imports.....	1.0	0.8	0.6	3.8	9.2	7.1	8.6	3.1	2.4	1.4	3.0	4.1	15.7	24.5
Consumption.....	125.0	133.7	138.2	127.3	119.8	137.9	143.4	150.2	155.8	165.5	179.6	190.7	186.2	196.3
Seed.....	24.2	25.8	27.8	28.0	27.2	20.4	25.8	25.8	26.9	25.3	24.6	26.0	25.5	27.9
Food.....	48.1	49.1	49.6	48.0	48.5	50.3	53.3	53.7	54.0	54.2	57.5	58.6	59.4	60.0
Industrial use.....	2.2	2.0	2.2	2.0	2.4	2.1	2.0	2.3	2.4	2.5	2.8	2.9	3.0	3.1
Exports.....	6.9	7.9	8.3	6.7	4.0	5.3	4.4	6.9	6.4	8.5	6.8	9.7	5.5	6.2
Livestock feed....	43.7	48.8	59.3	42.6	37.7	53.8	57.9	61.6	66.1	74.9	87.9	93.4	92.8	99.2
Changes in stocks ³ ..	1.2	-3.3	0.6	-15.4	42.1	-8.8	36.3	0.4	14.7	-0.8	10.8	-7.1	-2.0	46.8

¹ Because of rounding, components may not add to the totals shown. Data are for the year beginning 1 January.

² The official measure of grain output is determined in terms of "bunker weight" - i.e. as it comes from the combine. To the extent that the grain contains trash, dirt, weed seeds, and moisture in excess of standard norms, and subsequent losses occur in transportation and storage, the official series exaggerates the quantity of usable grain. Indirect evidence suggests that this exaggeration is substantial and varies over time. Part of this exaggeration is reflected in the line for "livestock feed", and part falls as a residual into the line "changes in stocks."

³ The officially reported series for domestic production plus imports minus consumption.

DISCUSSION

Introduction

1. Although the USSR reports grain production, it does not release information on the main uses of grain, the size of stocks, or the amounts lost in transportation and storage. This report is intended to fill some of the gaps in Western knowledge of the production and allocation of Soviet grain for 1960-73.¹ It (1) sets out those elements of a Soviet grain balance that can be estimated with varying degrees of certainty; (2) describes the pitfalls in using official figures for production and the difficulties of estimating grain fed to livestock; and (3) assesses the implications of the partial balances for estimates of grain stocks. For the first time, systematic (although incomplete) balances are presented for total grain and for each type of grain for each year since 1960.

2. To understand Soviet policy regarding grain production, distribution, and trade, it is desirable to see conditions "through Soviet eyes"—that is, to use the statistics Soviet policymakers use. Adjusting Soviet grain statistics to make them comparable with US concepts distorts the supply and demand relationships to a degree and introduces elements that do not necessarily improve grain accounting accuracy. In the past, for example, "gross" grain production has frequently been discounted by 10%-25% in order to derive "net" production and to account for excess moisture, weeds, trash, and other nongrain matter gathered during the harvest and included in Soviet production data. But these discounts rested on slender evidence as far as year-to-year changes are concerned. Furthermore, this report uses Soviet data solely to calculate balances. It does not attempt to make international comparisons or to address questions such as feeding efficiency that would require the reconciliation of Soviet production data with the data of other countries.

3. It is hoped that the estimates contained in this report will be reviewed critically by other students of Soviet agriculture. An improved knowledge of the grain balances is essential for the interpretation of Soviet domestic economic and foreign trade policies.

¹ In the pioneering balance work, Naum Jasny presented estimates for the period up to the end of World War II (*The Socialized Agriculture of the USSR*, Stanford University Press, 1949). Nancy Nimitz then presented some grain balances in a study appearing in 1964 (RM 4127-PR, RAND Corporation, *Soviet Government Grain Procurements, Dispositions, and Stocks, 1940, 1945-63*, November 1964). She dealt only with the allocation of grain purchased by the state, however—about 30% to 45% of total production. Subsequently, the US Department of Agriculture estimated the uses of "food grains" in 1958-64 and the uses of total grain, feed grain, and wheat in 1960-74, but the derivation of these estimates was not presented in detail. (Selected food grain—wheat and rye—estimates are presented in USDA, Economic Research Service, ERS Foreign 135, *Soviet Grain Imports*, Washington, D.C., 1965. For total grain balances, 1960-72, see USDA, Economic Research Service, ERS Foreign 355, *Livestock Feed Balances for the USSR*, Washington, D.C., no date. Wheat and feed grain balances are regularly presented in USDA, Foreign Agricultural Service, *Foreign Agriculture Circular—Grains*.)

The Balance Method

4. In the traditional procedure for analyzing grain balances, total available grain in a given year is first determined by summing estimates of (1) domestic production, (2) imports, and (3) stocks at the beginning of the year. From this total, estimates of grain used for seed, food, industrial raw materials, exports, and livestock feed or lost for various reasons are subtracted. The residual represents the stocks at the end of the year.

TRADITIONAL GRAIN BALANCE

SUPPLY		DEMAND		RESIDUAL
Stocks at the beginning of the year + domestic production + imports	-	Seed + food + industrial raw materials + exports + livestock feed + losses	=	Stocks at end of year

5. Modified grain balances are derived in this report for nine specific grains and a small residual "other grains" category.² The modifications are a concession to Soviet secrecy.

GRAIN BALANCE USED IN THIS REPORT

SUPPLY		DEMAND		RESIDUAL
Domestic production + imports	-	Seed + food + industrial raw materials + exports + livestock feed	=	Change in stocks during year + "losses"

- Soviet grain stocks are a state secret.³ Indeed, the major reason for undertaking the balance work is to shed some light on these stocks.
- A portion of the excess moisture and waste and all of the grain lost in transit, in use, and in storage cannot be estimated directly. (As a short-hand method of expression, these elements are referred to as "losses" in this report.⁴) Therefore, we compare supply, excluding initial stocks, with demand, excluding losses in each year, to obtain an estimate of annual changes in stocks for all grain and annual losses from production and stocks.
- Because the grain fed to livestock cannot be allocated by type,⁵ the residuals listed in the balances for individual grains include grain fed, as well as grain lost and stock changes.

The Supply of Grain

Production

6. Grain production in the USSR increased more than 75% between 1960 and 1973 as a result of the introduction of better seed varieties, the improve-

² The balances are presented and explained in Appendix A.

³ *Ugolovniye kodeks RSFSR*, Moscow, 1957, p. 143-145.

⁴ These losses exclude the apparently substantial quantity of excess moisture and waste contained in livestock feed, see footnote 23.

⁵ For estimates of total grain fed to livestock, see Appendix B.

and harvesting practices, the use of more fertilizer and farm machinery, and a 10% increase in sown area (see Figure 1). The overall trend in output has been obscured by large year-to-year changes.⁶ For example, the crop in 1973, a year of favorable weather, was one-third larger than the drought-stricken 1972 crop. Since 1960 the USSR has experienced 5 years of nearly normal weather, 4 years of above-normal weather, and 5 years of subnormal weather.⁷ During those 14 years there were 5 bumper crops and 6 crops that could not cover domestic requirements.

7. Since 1960, as production has climbed, its composition has changed, as follows:

Percentage Distribution of Grain Production¹

	1960	1965	1970	1973
Total	100	100	100	100
Spring wheat	36.5	22.9	30.7	27.0
Winter wheat	14.6	26.3	22.6	22.1
Rye	13.1	13.4	7.0	4.8
Buckwheat	0.5	0.8	0.6	0.6
Rice	0.2	0.5	0.7	0.8
Corn	7.8	6.6	5.0	5.9
Oats	9.6	5.1	7.6	7.9
Barley	12.7	16.8	20.4	24.7
Millet	2.5	1.8	1.1	2.0
Pulses	2.2	5.5	4.1	3.8
Other	0.2	0.2	0.1	0.1

¹ Because of rounding, components may not add to the totals shown.

8. In particular, feed grains have received far greater attention.⁸

- Barley, whose share of total production rose from 13% in 1960 to 25% in 1973, has been stressed because it generally has higher yields than other spring grains.
- Oats are making a comeback and now provide 8% of total grain production. The cultivation of oats fell into disfavor on Soviet farms in the early 1960s, primarily in response to unfavorable prices.⁹ Since 1963 the acreage sown to oats has doubled; production in 1973 was nearly half again larger than in 1960.

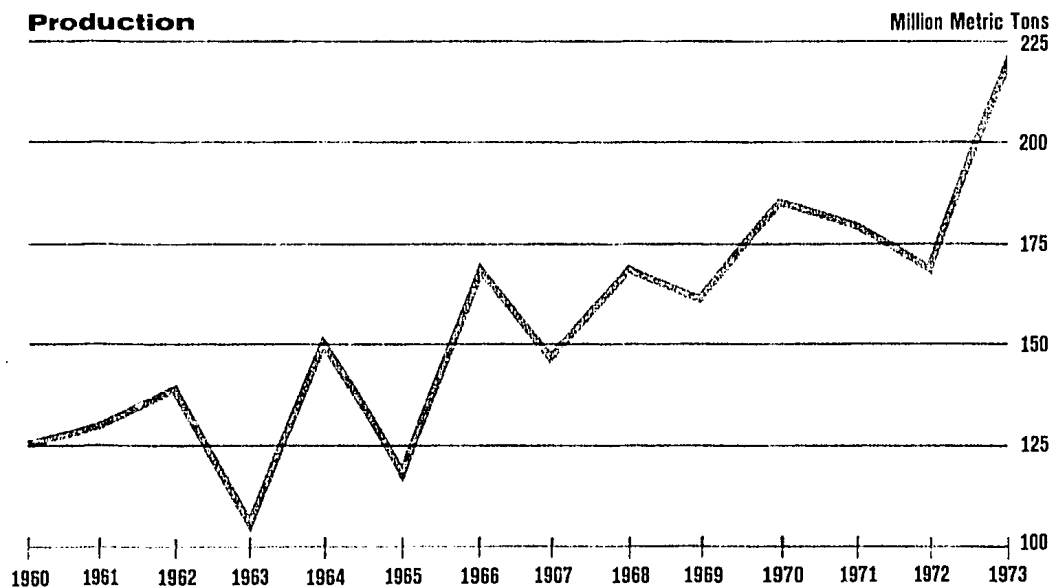
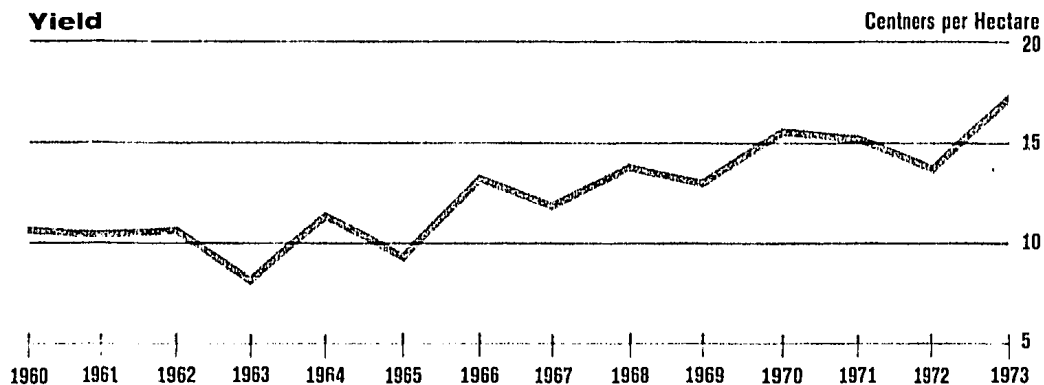
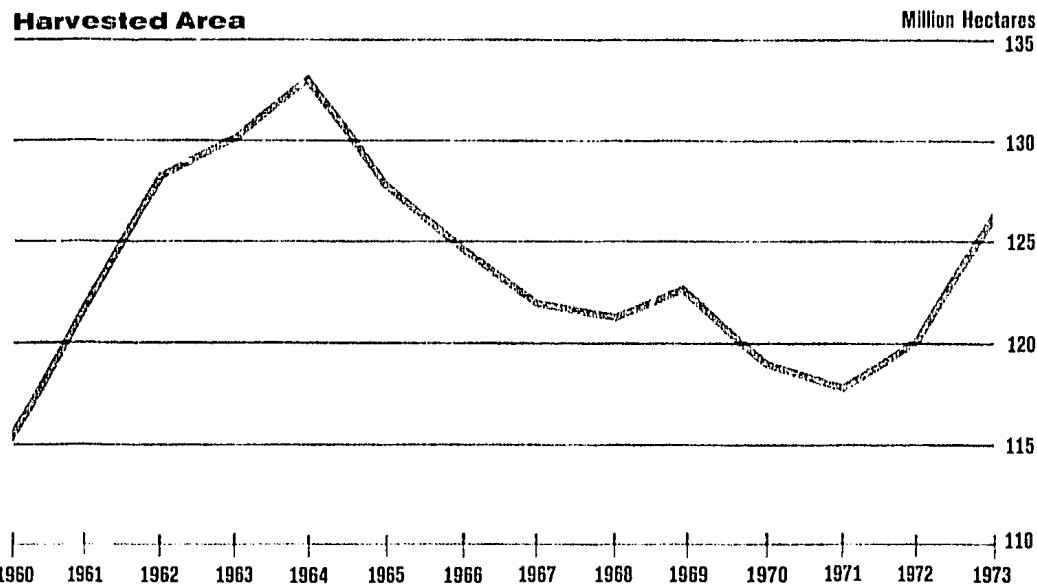
⁶ Soviet grain production is handicapped by a short growing season and by insufficient moisture in many areas. Grain requires a 100-day growing season, which generally is not present north of about 55°N. The 10-inch annual rainfall minimum required for grain limits the southern extension of grain cultivation. The Soviet grain belt lies mainly between 45°N and 55°N. West of the Urals the average annual precipitation ranges from 20 to 25 inches, ample for grain growing needs. But rainfall varies greatly from year to year, and seasonal distribution is unfavorable. Peak monthly rainfall is in July or August—too late to benefit the maturing grain. Precipitation decreases southward and eastward and is lowest in the desert steppes which extend from the lower Volga east and south across the southern part of Kazakhstan and into Central Asia. Even in years of adequate rainfall, torrential precipitation may greatly damage the crop.

⁷ "Above-normal" weather refers to conditions where crop loss caused by summer drought and cold winter temperatures is less than the long-run average. "Subnormal" weather produces greater-than-average losses.

⁸ Small quantities of each feed grain are also used for food.

⁹ In the early 1960s, oats were priced at two-thirds or less of the price of wheat, so those farms that could substitute, did. By 1967, however, the price relationships had improved and farms planted more oats (see *Ekonomika zernogo khozyaystva*, A. E. Kaminskiy et al., eds., Moscow, 1970, p. 158, 196).

USSR: Grain Statistics



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- Although corn does not thrive in the harsh climate of the USSR, Khrushchev launched a campaign in the mid-1950s to increase corn production. His removal led to a drastic curtailment in acreage. Since the mid-1960s, nonetheless, production has gradually made a comeback as the need for high-energy feed has increased.
 - Pulses—peas and beans—are included in Soviet grain statistics¹⁰ and account for about 4% of total grain production. These crops provide food and feed rich in protein.
9. Traditional breadgrains still account for nearly three-fifths of production:
- Wheat comprises one-half of total grain production, divided into lower yielding spring wheat and higher yielding winter wheat (see Table 1). Although wheat is used primarily for food, as much as one-third of the total wheat crop has been used as livestock feed in recent years.
 - Rye remains important because of the Russian fondness for rye breads.
 - Rice output, although less than 1% of total grain production, has been increasing at 19% per year since 1960 and now almost meets domestic requirements.
 - Millet and buckwheat, while accounting for 2% and 1% of total production, are extensively used as porridge.

Table 1

USSR: Grain Production¹

	Million Metric Tons													
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total.....	125.6	130.9	140.1	107.4	152.0	121.1	171.0	147.7	169.3	162.3	186.8	181.2	168.2	222.5
Spring wheat....	46.1	37.3	40.4	28.5	48.2	27.8	60.2	42.3	58.7	52.7	57.5	51.1	56.6	60.0
Winter wheat....	18.2	29.2	30.4	21.2	26.2	31.9	40.3	35.1	34.6	27.2	42.2	47.8	29.4	49.2
Rye.....	16.4	16.7	17.0	11.9	13.6	16.2	13.1	13.0	14.1	10.9	13.0	12.8	9.6	10.8
Buckwheat.....	0.6	0.9	0.9	0.5	0.7	1.0	0.9	1.2	1.5	1.4	1.1	1.2	0.8	1.3
Rice.....	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.1	1.1	1.3	1.4	1.6	1.8
Corn.....	9.8	17.1	15.5	11.1	13.8	8.0	8.4	9.2	8.8	12.0	9.4	8.6	9.8	13.2
Oats.....	12.0	8.9	5.7	4.0	5.5	6.2	9.2	11.6	11.6	13.1	14.2	14.6	14.1	17.5
Barley.....	16.0	13.3	19.5	19.8	28.6	20.3	27.9	24.7	28.9	32.7	38.2	34.6	36.8	55.0
Millet.....	3.2	2.9	2.8	1.8	3.5	2.2	3.1	3.2	2.7	3.3	2.1	2.0	2.1	4.4
Pulses.....	2.7	4.0	7.6	8.0	11.1	6.7	7.0	6.6	7.2	7.8	7.6	6.9	7.1	8.4
Other.....	0.3	0.3	0.1	0.2	0.2	0.2	0.1	0.1	....	0.1	0.2	0.2	0.2	0.3

¹ See Appendix Tables A-2 through A-11; with the exception of spring and winter wheat, which are from USSR, Central Statistical Administration (hereafter TsSU), *Sel'skoye khozyaystvo*, Moscow, 1970, p. 164-167; TsSU, *Narodnoye khozyaystvo SSSR v 1972 godu*, Moscow, 1973, p. 316, 326-27 (hereafter *Narkhoz* and the appropriate year); and TsSU, *SSSR v tsifrakh v 1973 godu*, Moscow, 1974, p. 108-109. Because of rounding, components may not add to the totals shown.

Imports

10. Since 1960, Soviet imports of grain and grain products have ranged from 600,000 metric tons in 1962 to more than 24 million tons in 1973. In 8

¹⁰ There is one more officially reported category—"other grains." Although the precise composition of this category (accounting for 0% to 0.2% of total grain each year) is unknown, it includes spelt (a primitive type of wheat producing only two kernels), *smes' kolosovykh* (mixed grain, whose composition is unknown), and sorghum. The area sown to these three "types" of grain in 1973 was 234,000 hectares, 0.18% of total grain area. Of this area, spelt occupied 4%, mixed grain 50%, and sorghum 46% (TsSU, *Posevnyye ploshchadi vo vseh kategoriakh khozyaystva po soyuznym respublikam v 1973 godu*, Moscow, 1973, p. 7, 29, 43.)

Table 2

USSR: Grain Imports in Selected Years¹

	1963			1964			1965			1966			1967			1971			1972			1973		
	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply
Total.....	3.8	3.4	9.2	5.7	7.1	5.6	8.6	4.8	3.1	2.0	4.1	2.2	15.7	8.5	24.5	3.9	4.1	2.2	15.7	8.5	24.5	3.9	4.1	2.2
Wheat.....	3.4	6.5	8.6	10.4	6.8	10.2	8.0	7.4	2.1	2.7	2.7	2.6	8.5	9.0	15.6	12.5	2.7	2.6	8.5	9.0	15.6	12.5	2.7	2.6
Rye.....	Negl.	Negl.	Negl.	Negl.	Negl.	Negl.	Negl.	Negl.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Rice.....	0.3	43.7	0.5	53.7	0.4	38.0	0.4	36.8	0.6	40.0	0.5	25.9	0.4	20.4	0.2	11.6	0.5	25.9	0.4	20.4	0.2	11.6	0.5	25.9
Corn.....	---	---	---	---	---	---	0.2	1.9	0.4	3.8	0.9	9.3	4.1	29.4	5.4	29.0	0.9	9.3	4.1	29.4	5.4	29.0	0.9	9.3
Barley.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

¹ Years in which imports exceeded 3 million tons. For sources, see Appendix A. Because of rounding, components may not add to the totals shown.

years, imports exceeded 3 million tons (see Table 2). During 1972-73, 40 million tons of grain were imported, nearly the combined total for the previous 12 years.

Demand for Grain

11. The demand for grain has grown rapidly in the USSR as a result of a moderate increase in its use for food and a sharp expansion in its use as live-stock feed (see Figure 2). Indeed, growth in demand has outpaced production in recent years: average annual grain production in 1970-72 was 12% greater than in 1967-69, while domestic consumption increased by 18%.

Food

12. The USSR produces ample grain to feed its population. Even in years of harvest failure, food requirements consume less than one-half of total production. In a bumper harvest year such as 1973, only one-fourth of the grain (60 million tons) was used as food (see Table 3). The 25% increase in the amount of grain processed into flour and groats for human consumption in 1961-73 more than offset the 17% growth in population in part because of a decline in the average milling rate¹¹ for flour from 83% in 1960 to 80% in 1973 and also because of increased use of flour for other purposes.

13. Flour in the USSR is largely milled from wheat—83% in 1973. The remainder is mainly rye flour; only small quantities of flour are milled from buckwheat and other grains. Three-fifths of the flour is used by state bakeries to make bread. Most of the remaining flour is used for other bakery goods, noodles, and macaroni products—sold at retail or exported.

Table 3

USSR: Grain Used for Food in Selected Years¹

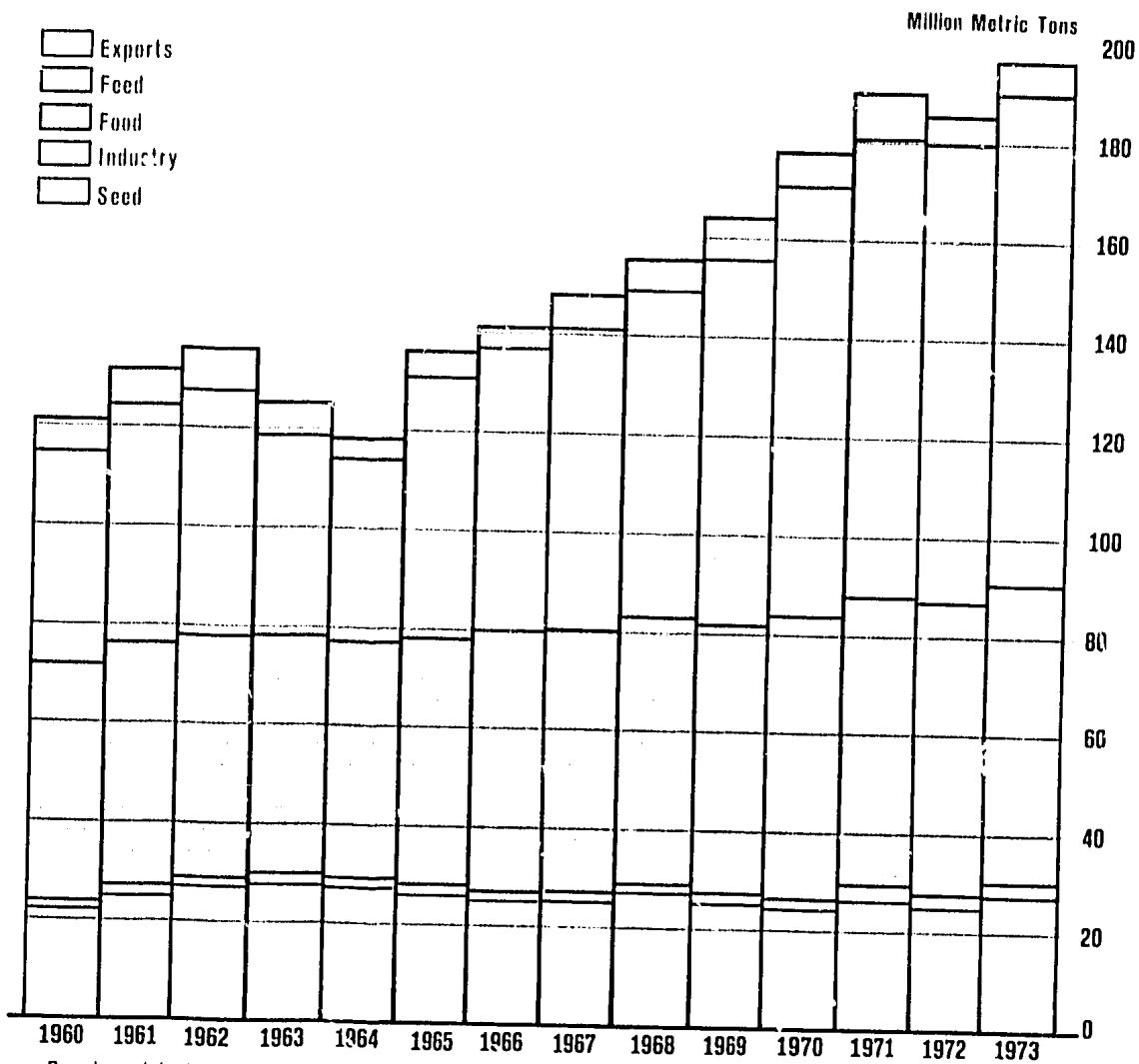
	1960		1965		1970		1973	
	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply
Total.....	48.1	38.0	50.3	39.2	57.5	30.3	60.0	24.3
Wheat.....	37.4	58.1	39.8	59.9	44.9	44.1	47.0	37.4
Rye.....	8.3	50.5	7.4	45.7	8.2	63.4	8.6	71.7
Buckwheat.....	0.2	23.9	0.3	27.3	0.7	62.9	0.7	53.1
Rice.....	0.9	97.9	0.7	79.1	1.1	62.4	1.2	57.6
Corn.....	0.2	2.3	0.4	5.6	0.5	5.3	0.5	2.7
Oats.....	0.3	2.6	0.1	1.2	0.2	1.3	0.2	1.1
Barley.....	0.2	1.5	0.4	2.2	0.5	1.4	0.5	0.9
Millet.....	0.4	13.9	1.1	50.1	1.1	53.6	1.2	26.0
Pulses.....	0.1	2.7	0.1	1.3	0.2	3.0	0.2	2.7

¹ For sources, see Appendix A. Because of rounding, components may not add to the totals shown.

¹¹ The "milling rate" refers to the weight of flour milled from the standard weight of grain. To offset grain shortages in 1963, the milling rate was raised to 86%, saving an estimated 2 million tons of grain.

Figure 2

USSR: Major Grain Allocations^a



14. Curiously, the data indicate that considerably more flour is produced than is consumed by the population or exported. For example, flour production in 1972 was 44 million tons while reported consumption by the population was about 34 million tons and exports were 0.4 million tons.¹² Flour is also used for industrial purposes—munitions, textiles, pastes and glues, and so on—and possibly for livestock feed.¹³ In addition, substantial losses occur in transport and storage, particularly in handling bagged flour. But the major reason for the discrepancy between production and reported use probably is the inadequacy of the consumption data. Reported consumption is based on the USSR's family budget survey, which is not representative of the entire population.¹⁴ According to Soviet authorities, some low income groups are not surveyed. As these groups probably eat more bread than middle and upper income groups, per capita flour consumption is understated by the family budget survey. In this report, flour production data rather than consumption statistics are used to estimate grain used for food.

15. Groats—coarsely milled products such as oatmeal and rice—are made from every grain except rye.¹⁵ Although less than 10% of grain used as food is in the form of groats, rice and millet are consumed only as groats and account for nearly one-half of total groats production.

Industrial Raw Materials

16. One to two percent of the grain crop is used by industry to make alcohol, beer, starch, and syrup (see Table 4).¹⁶ Wheat supplied 840,000 tons of the 1.3 million tons of grain used for alcohol in 1973. With the encouragement of beer production, the quantity of barley used to make beer has increased from 625,000 tons in 1960 to 1.2 million tons in 1973. Corn used for starch and syrup tripled during the 1960s, reaching 600,000 tons in 1973.¹⁷

¹² Production: *Narodnoye khozyaystvo v SSSR v 1973 godu* (hereafter *Narkhoz* and the appropriate year), Moscow, 1974, p. 323.

Consumption: *Narkhoz* 1972, p. 557. Per capita consumption of flour, groats, bread, and grain products was 145 kilograms, of which about 10 kilograms are assumed to be pulses and groats. This assumption is based on *Sovetskaya torgovlya*, no. 7, 1968, p. 8-9 (which separates consumption of flour, groats, pulses, and macaroni products), and is consistent with estimated production, Appendix Table A-1.

Exports: USSR Ministry of Foreign Trade, *Vneshnyaya torgovlya SSSR za 1973 god*, Moscow, 1974, p. 33.

¹³ Because we cannot estimate flour fed to livestock, no adjustment for this purpose is included in the estimated quantity of grain fed to livestock (see Appendix B).

¹⁴ N. I. Buzlyakov, *Metody planirovaniya povysheniya urovnya zhizni* Moscow, 1969, p. 168.

¹⁵ Rice is usually hulled and polished as is some barley; the other grains are usually milled, coarsely flaked, or rolled for use as dry and cooked cereals.

¹⁶ No estimate of the quantity of grain that may go into *samogon* (home brewed alcohol) is included. A recent Western study estimates the quantity of *samogon* produced from 1956 to 1971. Assuming that private producers are one-third as efficient as industrial producers and that all *samogon* is produced from grain, the quantity of grain required over the period ranges from a low of 650,000 tons in 1959 to a high of 1.6 million tons in 1969. Because private producers prefer to distill from sugar, sugar beets, and potatoes, it is unlikely that such quantities of grain are used. V. Trembl, *Alcohol in the USSR: A Fiscal Dilemma*, paper presented at the International Slavic Conference, September 1974, Banff, Canada.

¹⁷ Starch is also produced from potatoes.

Table 4

USSR: Grain Used for Industrial Raw Material in Selected Years¹

	1960		1965		1970		1973	
	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply
Total	2.2	1.7	2.1	1.6	2.8	1.5	3.1	1.3
Wheat	1.1	1.7	0.1	0.1	0.8	0.7	0.8	0.7
Rye	0.1	0.6	0.1	0.5	0.1	0.8	0.1	1.1
Buckwheat	Negl.	1.7	Negl.	2.2	Negl.	1.8	Negl.	1.8
Corn	0.2	2.1	0.7	8.7	0.6	0.4	0.6	3.4
Oats	0.1	0.4	Negl.	0.1	Negl.	0.1	Negl.	0.1
Barley	0.7	4.3	1.2	5.9	1.2	3.2	1.4	2.4
Millet	Negl.	0.9	Negl.	1.0	Negl.	1.7	Negl.	0.9
Pulses	Negl.	0.4	Negl.	0.3	Negl.	0.2	Negl.	0.3

¹ For sources, see Appendix A. Because of rounding, components may not add to the totals shown.

Seed

17. Each year, 24-28 million tons of grain are used for seed (see Table 5). Improved yields have lowered the share of the crop set aside for seed from about one-fifth in the first half of 1960s to one-seventh in the 1970s. The quantity of grain required for seed is estimated from the area planted and the officially recommended seeding rates. These "norms" vary according to the type of grain, ranging from 0.23 centner per hectare for corn for grain to 2.40 centners for rice; the seeding rate for spring wheat, the most important grain, is 2.0 centners per hectare.¹⁸ The range in the amount of grain used for seed results partly from minor shifts in cropping patterns and partly from the varying amounts of reseeded necessary because of winterkill.¹⁹

¹⁸ These norms seem high compared with Western practice—in Canada the rate for spring wheat is 1.0 centner per hectare while in the United States the average is 0.9 centner. (For Canada, *Dominion Bureau of Statistics Catalogue*, No. 22-002, 17 June 1970, p. 4. For the United States, W. H. Leonard and J. N. Martin, *Cereal Crops*, Macmillan Co., 1963, p. 787.)

There is evidence, however, that Soviet farms follow or exceed the norms. According to *Komsomolskaya pravda*, the president of VASKhNIL, P. P. Lobanov, said "It is certainly tempting to think of cutting the seeding rate . . . [it] would save millions of tons of seed . . . [but] if the sowing operation is conducted at a late date, on poor soil, and following a poor predecessor crop, a reduction in the seeding rate could produce very undesirable results. . . . Certainly, the seeding rates will decrease as improvements are carried out in farming techniques . . . [but] is it possible for us to . . . make the recommendation. Reduce the seeding rate? No, it is not possible since it would be a premature and hasty conclusion." (*Komsomolskaya pravda*, 18 May 1971, p. 2.) *Pravda Ukrainy* sheds further light on the exceeding of norms: "How much seed is wasted by farmers who try to compensate for low germinating power by exceeding the sowing norms? It is estimated that no less than 100,000 tons of ballast grain are sown yearly over the approximately 6 million hectares of our republic which are devoted to spring grain and legume crops." (*Pravda Ukrainy*, 24 January 1971, p. 2.)

¹⁹ According to one Soviet source, during 1951-70 an average of 4.7 million hectares of grain were winterkilled each year. (V. N. Semenov, *For finansov i kredita v razviti sel'skogo khozyaystva*, Moscow, 1973, p. 179.) The year-to-year fluctuation ranges from nearly zero to as much as 11 million hectares.

Table 5

USSR: Grains Used for Seed in Selected Years¹

	1960		1965		1970		1973	
	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply
Total.....	24.2	19.1	26.4	20.6	24.6	13.0	27.9	11.3
Wheat.....	13.3	20.6	15.3	23.0	13.9	13.0	14.8	11.8
Rye.....	3.7	22.4	3.3	20.1	2.2	10.8	1.0	15.9
Buckwheat.....	0.2	20.6	0.2	10.4	0.2	10.1	0.2	12.9
Rice.....	Negl.	2.6	0.1	0.3	0.1	5.3	0.1	5.9
Corn.....	0.8	8.2	0.8	9.0	0.7	7.2	0.7	3.9
Oats.....	2.3	19.2	1.4	23.2	1.9	13.5	2.5	11.0
Barley.....	2.7	10.9	3.9	19.4	4.4	11.1	6.2	10.9
Millet.....	0.1	3.5	0.1	1.4	0.1	3.4	0.1	2.0
Pulses.....	1.0	30.9	1.4	20.4	1.2	15.0	1.4	17.0
Other.....	Negl.	12.2	Negl.	11.0	Negl.	10.2	Negl.	8.2

¹ Quantity of seed required to sow the next year's crop. For sources, see Appendix A. Because of rounding, components may not add to the totals shown.

Exports

18. According to official Soviet foreign trade statistics, a small and declining share of Soviet grain is exported (see Table 6). Since 1960, grain exports have ranged from 4.0 million tons in 1964 to 9.7 million tons in 1971. Wheat accounts for the bulk of exported grain, and most of it goes to client states in Eastern Europe and to Cuba.

Livestock Feed

19. Estimates of total grain fed (see Table 7) are calculated from official Soviet data on the quantity of concentrates fed. These data, however, are not presented by type. From total concentrates fed, we deduct the estimated quantities of milling by-products, oilseed meals, and alfalfa meal fed, leaving a residual of grain fed.²⁰ In contrast to other uses of grain, a breakdown of total grain fed by type of grain cannot be determined.²¹ Moreover, unlike the estimates for the other uses of grain, grain fed to livestock is almost certainly overstated because the estimates are based on production data rather than on standardized, or "procurement," weight.²² The difference between reported grain fed and grain of standardized weight could be substantial. Indeed, our calculations suggest that the weight of gross grain fed exceeded standardized

²⁰ For the sources and derivation of our estimates, see Appendix B. No estimate of the small amount—well under 1 million tons—of dried residuals of the starch, beet sugar, and distilling industries fed as concentrates is included. The Soviet definition of concentrates excludes animal and synthetic proteins.

²¹ Only the summary grain balance—Appendix A, Table A-1—includes feed use; with the exception of rice, the individual grain balances usually end with large residuals, which in part represent feed.

²² The difference between production and standardized weight is: (1) excess moisture, trash, and dirt, which have no nutritional value, and (2) weed seeds and grain admixtures, which may have substantial feed value, particularly in cases where one grain has grown mixed with another.

Table 6

USSR: Grain Exports in Selected Years¹

	1960		1965		1970		1973	
	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply	Million Metric Tons	Percent of Total Supply
Total.....	6.9	5.5	5.3	4.1	6.8	3.6	6.2	2.5
Wheat.....	5.7	8.8	2.0	3.1	5.8	5.7	5.0	4.0
Rye.....	0.7	4.2	Negl.	0.2	0.2	1.1	...	...
Rice.....	Negl.	2.6	Negl.	0.5	Negl.	0.7	...	...
Corn.....	0.1	1.2	0.0	0.0	0.3	2.0	0.1	2.0
Oats.....	Negl.	0.4	Negl.	0.2	...	...	Negl.	0.1
Barley.....	0.3	1.0	2.1	10.2	0.5	1.3	0.5	0.9
Pulses.....	...	...	0.5	8.0	0.1	0.9	Negl.	0.0

¹ For sources, see Appendix A. Exports include flour, groats, and pulses converted to grain basis. Because of rounding, components may not add to the totals shown.

Table 7

USSR: Grain Used for Livestock Feed

	Million Metric Tons ¹	Percent of Total Supply ²
1960.....	43.7	31.5
1961.....	48.8	37.1
1962.....	50.3	35.7
1963.....	42.0	38.3
1964.....	37.7	23.1
1965.....	53.8	12.0
1966.....	57.9	32.2
1967.....	61.6	10.8
1968.....	66.1	38.5
1969.....	71.9	15.8
1970.....	87.0	16.3
1971.....	93.4	50.1
1972.....	92.8	50.5
1973.....	99.2	10.2

¹ See Appendix A, Table A-1, "Livestock feed."

² Derived from Appendix A, Table A-1, "Livestock feed," divided by "Supply." (Supply equals production plus imports.)

weight during 1961-70 by 12% to 21%.²³ These differences, however, cannot be compared with those that may exist in other countries; we do not know how much nongrain material is included in grain fed or how much damaged or spoiled grain may be fed in any country.

²³ These calculations are based on the conflict between published information on (1) tons of concentrates fed and (2) the quantity of feed units consumed by livestock as concentrates. When the published tonnage figures are converted to feed units by standard norms, they show a total for feed units of concentrates fed to livestock that is substantially higher than the published figures. We believe that the published series for feed units has been adjusted to exclude excess moisture, dirt, and extraneous matter. The adjustment, however, cannot be precise, because it seems to depend on estimates of the number of feed units that would have been required to produce the annual volume of livestock output—a procedure that also involves the use of norms of dubious accuracy and does not account for other factors that influence livestock productivity.

20. The problem lies in the procedures for accounting for the disposition of grain held by the farms. Each Soviet farm regularly reports to the Central Statistical Administration the feed that it has on hand as well as the quantity it used during the preceding period. The tonnage figures are based on the farm's own production of grain (probably on a gross basis) plus any quantities purchased (probably on a standard basis). In making its report, the farm is also instructed to "determine losses incurred in storage and feeding."²¹ Soviet estimates of feed used by the private sector, which produces roughly one-third of all livestock products, are based on family budget survey data.

21. Because of the way we believe official figures on feed use are calculated, much of the exaggeration of Soviet grain production resulting from excessive moisture, dirt, and the like appears in the data on the amount of grain available for feed. In other words, some of the grain reported as being fed would not qualify as standardized, or "procurement," weight grain. The trash in the grain set aside for feed would, as a matter of course, eventually be "fed"—whether the accounting is done on a running inventory basis or whether rations are weighed as used. On the other hand, the excess moisture in the grain when it was received in storage may evaporate during storage. In a running inventory, the moisture would probably be counted as being fed; but if rations are weighed, the weight loss should be accounted for in some other way, such as residual losses equaling the difference between the weight of the grain when stored and when fed.

22. Setting aside the question of bias in the official figures on grain fed, we estimate that about one-third of the total grain crop was fed to livestock in the early 1960s. Livestock herds, however, were a residual claimant. In poor harvest years, grain rations were cut and livestock slaughtered to conserve supplies. The 1963 harvest failure, for example, led to a one-fifth reduction in grain used for feed. In recent years the livestock program has received higher priority. Livestock herds have increased, and grain fed per animal has risen rapidly. Rather than cut rations or herds in bad crop years, the regime has chosen to import grain. Indeed, nearly 100 million tons of grain were fed to livestock in 1973—the year after the partial crop failure in 1972. This was more than twice the amount fed in 1960.

Losses and Additions to Stocks

23. The estimates of grain used for seed, food, industrial use, and export are believed to be reasonably accurate. The estimates of grain fed are less reliable. Estimates of changes in grain stocks are necessarily still more uncertain because they are derived as residuals after subtracting (1) grain used from available supplies and (2) "losses" (excluding excess moisture and waste in grain retained on the farm).

²¹ S. S. Sergeyev, *Seĭskokhozyaystvennaya statistika s osnovami ekonomicheskoy statistiki*, Moscow, 1968, p. 212. How this is done is not explained. While most farms undoubtedly weigh feed rations, particularly grain rations, the literature is replete with examples of farms that do not. Moreover, farm accounts do not indicate that losses are reported systematically.

Table 8

USSR: Derivation of Changes in Stocks and Losses

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
1. Sum of residuals in grain balances ¹	45.3	46.8	52.8	26.5	79.0	44.1	94.2	62.2	82.0	73.0	98.0	88.0	90.6	149.7
2. Adjustment to convert seed from crop year to calendar year basis														
a. Seed required for crop of following year ²	24.2	25.8	27.8	28.0	27.2	26.4	25.8	25.8	26.9	25.3	24.6	26.0	25.5	27.9
b. Seed sown in given calendar year ³	23.8	24.6	26.1	28.7	27.9	27.3	25.8	25.5	25.7	26.4	25.3	24.1	25.7	24.2
3. Production less net exports and seed, food, and industrial uses ⁴	44.9	45.5	51.2	27.2	79.7	45.0	94.2	61.9	80.8	74.1	98.7	86.4	90.8	146.0
4. Grain f.d. ⁵	43.7	48.8	50.3	42.6	37.7	53.8	57.9	61.6	66.1	74.9	87.9	93.4	92.8	99.2
5. Changes in stocks plus losses ⁶	1.2	-3.3	0.9	-15.4	42.1	-8.8	36.3	0.4	14.7	-0.8	10.8	-7.1	-2.0	16.8

¹ Sum of "Residual" from Appendix Tables A-2 through A-11.² Appendix Table A-1.³ To adjust to a calendar year basis, the first step is to divide the seed required for the crop of the following year (year n + 1) into that used for winter grains - wheat, rye, and barley - and that used for spring grains. (The basic estimates are available in this Office and can be supplied on request.) The second step is to add the seed required for winter grains for the crop in year n + 1 to the seed required for spring grains for the crop in year n.⁴ Adjusted to reflect calendar year use of seed (line 1 less line 2a, plus line 2b); because of rounding, components may not add to the totals shown.⁵ Appendix Table B-1.⁶ Line 3 less line 4; because of rounding, components may not add to the totals shown.

24. In any event, subtracting estimates of demand from the supply estimates reveals a residual of enormous variability²⁵ (see Table 8). In three of the years since 1960 the residual available to cover losses or to add to stocks was more than 35 million tons. On the other hand, the residual was negative in 6 of the 14 years.

25. The estimation of the grain available to increase stocks—given the existing sources of information—can only be illustrative. In any country, some harvested grain is lost in transport, damaged or consumed by insects and rodents, and so on. In the USSR, there is, in addition, the bunker weight problem—that is, the weight of harvested grain is estimated as it comes from the combine, not on a cleaned and dried, or "standard," basis.²⁶

26. Although there is no good reason for choosing a particular loss rate, very low or high rates do not make much sense if the supply and demand estimates that were presented earlier are reasonable. For example, suppose that at the end of 1972—just before the major grain imports became available—stocks were 100 million tons. At this level, stocks would have been a far cry from the "years's needs" that Soviet officials have mentioned as their goal for stocks.²⁷ Even if production could provide stocks of this magnitude, the USSR probably lacks the storage capacity required to hold a one-year grain supply (currently about 200 million tons) and, at the same time, handle the current crop. In 1973, total storage capacity was about 225 million tons.²⁸

27. Unfortunately, estimates of stock accumulation are highly sensitive to variations in the loss rate. (In our accounting scheme, losses should be assessed against the stocks on hand at the beginning of the year as well as the production and import less feed for the given year. We do not know the stocks, so we apply assumed loss rates to production and imports less feed only.) Loss rates ranging from 0% to 10% have been tested for reasonableness and result in quite different levels of implied stock changes (see Table 9).

²⁵ Estimates of stock changes in this report are derived on a calendar year basis because the data on uses are reported this way.

²⁶ "Standard" basis refers to specific standards for test weight, moisture content, weed content, and grain admixtures. There are separate standards for each soil-climatic zone and each grain; no single set of standards exists for the entire country, or for all grain. All government-purchased grain must meet these standards or is discounted accordingly.

²⁷ In his memoirs, Nikita Khrushchev wrote: "... although our reserves were modest; they never reached the desired level, which would have been nearly a full year's supply." (*Khrushchev Remembers, The Last Testament*, Little, Brown, and Company, Inc., 1974, p. 127.) Khrushchev's recollection appears consistent with his earlier statement: "To be protected against all contingencies, the government must have stocks amounting to not less than half the country's annual requirement for grain, or even the full annual requirement." (*Izvestiya*, 14 July 1964, p. 2.) In addition, a recent US delegation to the USSR was told that grain stocks should equal a year's needs. (*Report on Discussions in Meetings of USDA Agricultural Economists with Soviet Agricultural and Other Economic Officials in Moscow in November 1973*, Roger Euler, May 1974, background information report, p. 22.)

²⁸ *Ekonomika sel'skogo khozyaystva*, No. 3, 1975, p. 47; *Mukomol'noelevatornaya i kombiikormovaya promyshlennost'*, No. 4, 1975, p. 6; and *Elevatornaya promyshlennost', zernosusheniye, i zernochistka*, Moscow, 1974, p. 16. Nonfarm storage capacity equals about 120 million tons and is usually covered, frequently ventilated, and able to hold grain in good condition for long periods. Farm storage (see Figure 3) varies from open-air platforms and pits to well-ventilated, covered buildings. Although some farm capacity undoubtedly can maintain grain in good condition for long periods, much of it cannot. Reported capacity includes storage for grain and oilseeds. Annual production of sunflower seed, the USSR's major oilseed, averages about 5 to 7 million tons.

28. Thus, assuming 100 million tons of stocks at the end of 1972 and a storage and transportation loss rate of 0% implies that stocks were 100 million tons at the end of 1960 or equal to the level at the end of 1972 (see Figure 4 and Table 10).²⁰ Higher loss rates would result in even higher stock levels at the end of 1960. Stocks of these magnitudes probably could not have been stored. On the other hand, if losses had been zero, stocks in 1960 would have been only 30 million tons. This seems unreasonably low. Indeed, stocks would have been nonsensically negative at the end of 1963 if the loss rate were zero and end-of-year stocks had been less than 85 million tons at the end of 1972. Loss rates of between 2% and 4% appear to result in more reasonable accumulated stocks.

Table 9

USSR: Estimated Changes in End-of-Year Stocks, Based on Selected Loss Rates

	Million Metric Tons														
Loss rate (Per-cent) ¹	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	
0 ²	1.2	-3.3	0.9	-15.4	42.1	-8.8	36.3	0.4	14.7	-0.8	10.8	-7.1	-2.0	46.8	
2.....	-0.5	-5.0	-0.9	-16.8	39.6	-10.3	33.9	-1.4	12.6	-2.6	8.8	-8.0	-3.8	43.8	
4.....	-2.1	-6.6	-2.7	-18.1	37.2	-11.8	31.4	-3.2	10.5	-4.4	6.7	-10.8	-5.6	40.9	
6.....	-3.8	-8.3	-4.5	-19.5	34.7	-13.3	29.0	-5.0	8.4	-6.1	4.7	-12.0	-7.5	37.9	
8.....	-5.4	-9.9	-6.3	-20.9	32.2	-14.8	26.6	-6.7	6.3	-7.9	2.7	-14.4	-9.3	35.0	
10.....	-7.1	-11.6	-8.1	-22.3	29.8	-16.2	24.1	-8.5	4.1	-9.7	0.6	-16.3	-11.1	32.0	

¹ The loss rate is applied to production plus imports less grain used for feed in the given year.

² With a loss rate of 0%, the stock change is equal to annual supply (production plus imports) less demand for food, seed, industry, exports, and feed (see Table 8).

Table 10

USSR: Estimated End-of-Year Stock Positions, Based on Selected Loss Rates and a 100-Million-Metric-Ton Stock Level at the End of 1972¹

Million Metric Tons														
Loss rate (Per-cent) ²	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
0.....	32.2	28.9	29.8	14.4	56.5	47.7	84.0	84.4	99.1	98.3	109.1	102.0	100.0	146.8
2.....	54.8	49.8	48.9	32.1	71.7	61.4	95.3	93.9	106.5	103.9	112.7	103.8	100.0	143.8
4.....	77.4	70.8	68.1	50.0	87.2	75.4	106.8	103.6	114.1	109.7	116.4	105.6	100.0	140.9
6.....	100.0	91.7	87.2	67.7	102.4	89.1	118.1	113.1	121.5	115.1	120.1	107.5	100.0	137.9
8.....	122.4	112.5	106.2	85.3	117.5	102.7	129.3	122.6	128.9	121.0	123.7	109.3	100.0	135.0
10.....	145.2	133.0	125.5	103.2	133.0	116.8	140.9	132.4	136.5	126.8	127.4	111.1	100.0	132.0

¹ The annual changes in stock from Table 9 are applied beginning with 1972.

² The loss rate is applied to production plus imports less grain used for feed in the given year.

²⁰ Beginning with the assumed level of 100 million tons in 1972, the annual change in stock and the estimated annual loss rate are computed backward and forward from 1972.

Figure 3



"The grain's in. Now where to put the lock?"

Krokodil, No. 33, Nov 74

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29. All loss rates result in similar stock trends—sharp drawdowns in 1963, 1965, 1971, and 1972, and lesser drawdowns in 1961, 1967, and 1969. (The trends would be the same whatever the stock level assumed at the end of 1972.) As shown in Figure 4, the higher the loss rate the higher are stocks before the 1972 benchmark. Given the assumptions of Figure 4, higher loss rates do not suggest an urgent need for grain in 1963—that is, they do not suggest the actual situation, a need so strong that the leadership, in addition to importing grain, was forced to take actions causing civil unrest. Similarly the higher loss rates do not suggest a recurring need in 1965. Lower loss rates, on the other hand, indicate that stocks in 1963 and 1965 were drawn down to a point requiring imports and curbs on consumption. In the absence of reliable data on losses, estimates of stock change and stock accumulation can only be hypothetical and must be treated with caution. Nonetheless, the trend lines depicted in Figure 4 seem to be of some value in assessing Soviet need for grain.

Comparisons with Other Estimates and the Need for Further Research

30. The only other current Western estimates of a Soviet grain balance are compiled by the US Department of Agriculture. Because USDA estimates are based largely on crop years while the estimates in this report are on calendar years, a straightforward comparison cannot be made. Both sets of estimates begin with official grain production but disagree to a greater or lesser extent in each grain allocation. The largest differences occur in the estimated quantity of grain required for food and the losses in storage and transportation (see Table 11).³⁰ The major causes for the differences are:

- Our food estimates are consistently higher than USDA's because USDA uses per capita consumption data to estimate the use of grain for food while we rely on production data for flour and groats.
- Our balance implies a relatively low loss rate; USDA assigns rates varying from 7% to 16% of production. (USDA's rate includes an element of "discount" to account for excess moisture and trash in the bunker weight of grain.)

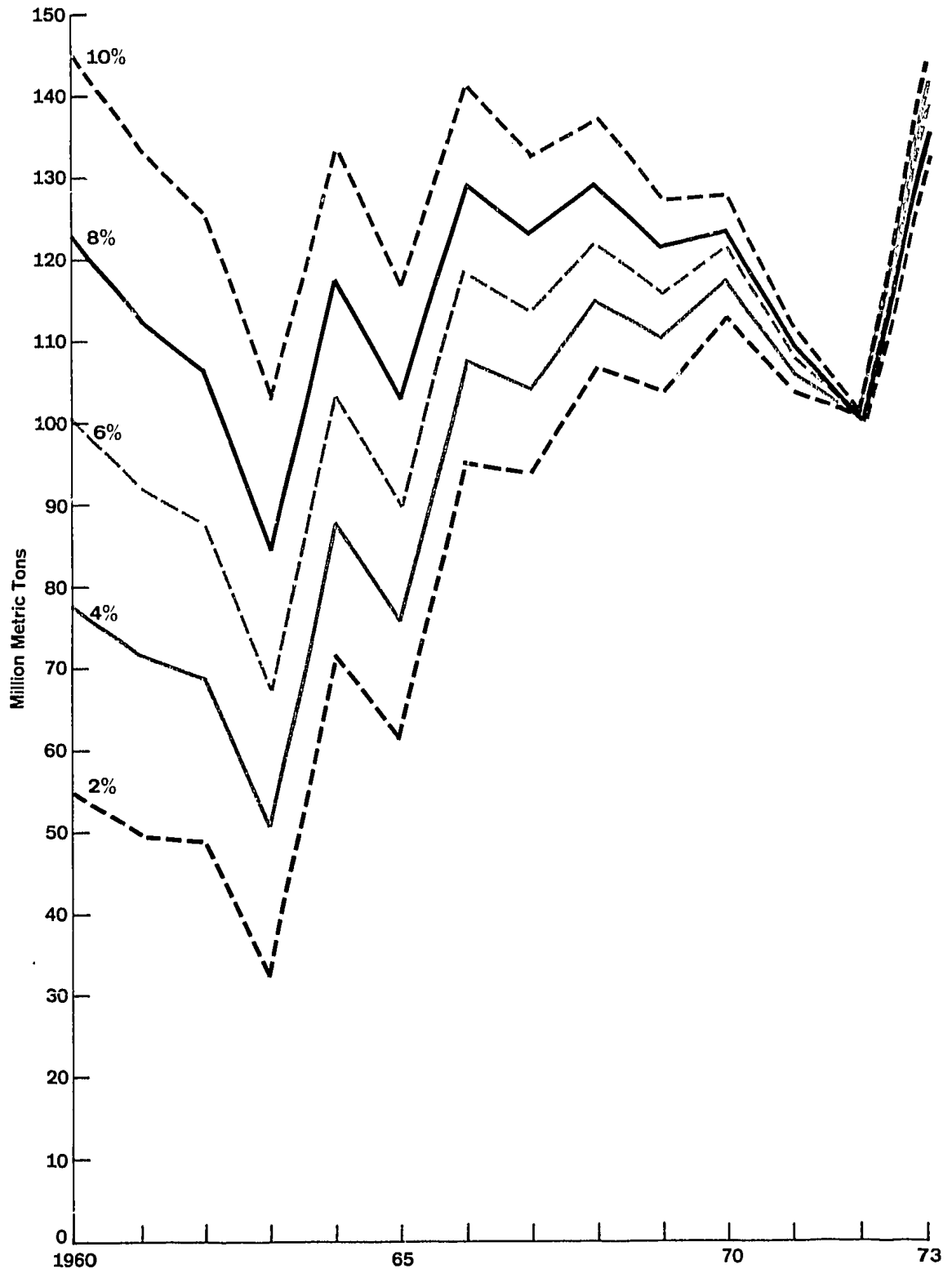
31. The differences in procedure, in turn, cause substantial differences in the estimated quantity of grain added to stocks (see Table 12). Our estimates are consistently lower than those of USDA; indeed our estimates are negative in 4 of the 10 years compared, while the USDA estimates are negative in only one year. Our accumulated losses plus changes in stock for the 10-year period are two-thirds of USDA's, a difference that underscores the difficulty of deriving grain balances from incomplete data.

³⁰ The comparisons are based on the balance presented in USDA, ERS, Foreign Agricultural Economic Report No. 101, *The Agricultural Situation in the USSR*, April 1975, p. 6, which contains the most recent USDA estimates and covers the period 1964/65 to 1974/75.

Figure 4

USSR: Estimated End-of-Year Stock Position

Based on selected loss rates and a 100 million metric ton stock level at the end of 1972.*



*Based on table 10.
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Table 11

USSR: Grain Allocations in Selected Years According to CIA¹ and USDA² Estimates

Million Metric Tons

Year		Seed		Food		Industrial Use		Feed		Losses ³	
CIA	USDA	CIA	USDA	CIA	USDA	CIA	USDA	CIA	USDA	CIA ³	USDA
1965.....	1965/66	27	24	50	44	2	3	54	50	5	12
1970.....	1970/71	25	25	57	45	3	3	88	92	8	22
1972.....	1972/73	20	20	59	40	3	3	93	97	7	15

¹ Table 2 and Appendix A.² USDA, ERS, Foreign Agricultural Economic Report No. 101, *The Agricultural Situation in the USSR*, April 1975, p. 6.³ Assuming a 4% loss rate; excludes losses resulting from excess moisture and trash in grain remaining on farms.

Table 12

USSR: Losses Plus Changes in Stock According to CIA¹ and USDA² Estimates

Year		Million Metric Tons	
CIA	USDA	CIA	USDA
1964.....	1964/65	42	36
1965.....	1965/66	-9	-2
1966.....	1966/67	36	40
1967.....	1967/68	....	9
1968.....	1968/69	15	20
1969.....	1969/70	-1	3
1970.....	1970/71	11	15
1971.....	1971/72	-7	13
1972.....	1972/73	-2	16
1973.....	1973/74	47	48
Total for the period.....		132	198

¹ Table A-1. Supply less consumption.² *The Agricultural Situation*, op. cit., p. 6.

32. Neither balance is completely satisfactory. In particular, further research needs to be done on:

- grain fed, including quantities of individual grains fed;
- the disposition of flour, especially the flour used as livestock feed;
- the use of calendar and/or crop year data as well as the effects of lagging certain types of data such as exports or food use;
- the "discount"; and
- the change in the composition and quality of stocks.

APPENDIX A

The Grain Balance — Sources and Methodology

In constructing grain balances for the USSR for 1960-73, we have relied on official data whenever possible. All data on domestic production and foreign trade are official data and are believed to be reasonably consistent. Estimates of most uses of grain are based largely on adjusted official data. For example, estimates of grain used in flour making are based on official data on flour production and published information on milling rates. As indicated in the text, however, estimates of stocks are residuals and consequently much less reliable.

Tables A-1 through A-11 present the *calendar year* balances for total grain and for 10 subcategories—wheat, rye, buckwheat, rice, corn, oats, barley, millet, pulses, and "other" grains. Table A-1, with two exceptions—livestock feed and exports—represents the summation of Tables A-2 through A-11. The livestock feed line, which appears only in Table A-1, is discussed below; its derivation is outlined in Appendix B. The exports line in A-1 includes exports of *krupa* (groats) not specified by type of grain. In most years, exports of *krupa* have been less than 50,000 tons (*krupa* is not a reported import category). Sources to Tables A-2 through A-11 follow Table A-11.

Table A-1

USSR: Supply and Consumption of Total Grains

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	126,581.0	131,018.0	140,729.0	144,474.0	161,449.0	128,209.0	179,042.0
Domestic production.....	125,501.0	130,887.0	140,121.0	107,410.0	151,903.0	121,001.0	171,018.0
Imports.....	1,023.0	701.0	608.0	3,755.0	9,486.0	7,148.0	8,024.0
Consumption.....	124,994.4	133,093.7	138,472.8	127,300.8	149,783.7	137,921.3	143,390.8
Seed.....	24,152.4	25,815.2	27,832.8	27,050.8	27,191.7	26,399.3	25,767.8
Food.....	48,087.0	49,433.0	49,636.0	48,047.0	48,534.0	50,317.0	53,311.0
Flour.....	15,530.0	16,100.0	16,180.0	14,480.0	13,950.0	17,070.0	19,804.0
Groats.....	2,557.0	2,973.0	3,476.0	3,507.0	4,584.0	3,247.0	3,501.0
Industry.....	2,188.0	2,030.0	2,152.0	4,080.0	2,390.0	2,446.0	1,963.0
Alcohol.....	1,360.0	1,079.0	1,168.0	1,004.0	1,280.0	829.0	655.0
Beer.....	625.0	670.0	700.0	702.0	708.0	792.0	859.0
Starch and syrup.....	203.0	290.0	284.0	283.0	408.0	495.0	449.0
Exports.....	6,887.0	7,850.5	8,262.0	6,704.0	1,002.0	5,259.0	4,449.0
Livestock feed.....	13,080.0	18,820.0	50,290.0	12,010.0	37,660.0	53,830.0	57,900.0
	1967	1968	1969	1970	1971	1972	1973
Supply.....	150,825.0	171,651.0	163,660.0	189,745.0	185,243.0	183,940.0	240,987.0
Domestic production.....	147,749.0	169,291.0	162,255.0	186,795.0	181,175.0	168,238.0	222,570.0
Imports.....	3,076.0	2,300.0	1,405.0	2,950.0	4,068.0	15,702.0	24,457.0
Consumption.....	150,213.8	155,762.9	165,408.5	179,601.8	190,676.9	186,181.2	196,263.8
Seed.....	25,777.8	26,913.9	25,344.5	24,593.8	26,023.9	25,525.2	27,949.8
Food.....	53,729.0	54,000.0	54,242.0	57,480.0	58,560.0	59,370.0	60,030.0
Flour.....	49,930.0	50,000.0	50,040.0	52,980.0	54,060.0	55,270.0	55,430.0
Groats.....	3,799.0	4,000.0	4,202.0	4,500.0	4,500.0	4,100.0	4,600.0
Industry.....	2,269.0	2,378.0	2,497.0	2,780.0	2,898.0	2,992.0	3,080.0
Alcohol.....	879.0	898.0	987.0	1,148.0	1,204.0	1,242.0	1,280.0
Beer.....	903.0	958.0	993.0	1,048.0	1,400.0	1,450.0	1,200.0
Starch and syrup.....	487.0	522.0	517.0	584.0	594.0	600.0	600.0
Exports.....	6,868.0	6,351.0	8,525.0	6,848.0	9,745.0	5,464.0	6,204.0
Livestock feed.....	61,570.0	66,120.0	74,860.0	87,900.0	93,450.0	92,830.0	99,200.0

Table A-2

USSR: Supply and Consumption of Wheat

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	61,130.0	67,171.0	70,859.0	53,126.0	81,030.0	60,462.0	108,520.0
Domestic production.....	61,299.0	66,183.0	70,778.0	49,688.0	71,199.0	59,689.0	100,499.0
Imports.....	131.0	688.0	76.0	3,438.0	8,631.0	6,779.0	8,030.0
Consumption.....	57,503.7	57,498.5	56,260.3	55,685.4	51,527.7	57,189.4	59,142.9
Seed.....	13,296.7	14,200.5	14,456.3	14,744.4	15,314.7	15,262.4	14,733.9
Food.....	37,149.0	37,305.0	36,556.0	36,380.0	36,659.0	39,815.0	41,099.0
Flour.....	37,170.0	37,150.0	36,200.0	35,950.0	36,200.0	39,539.0	40,850.0
Grouts.....	279.0	315.0	356.0	440.0	479.0	285.0	249.0
Industry.....	1,081.0	683.0	134.0	72.0	78.0	78.0	80.0
Alcohol.....	1,081.0	683.0	134.0	72.0	78.0	78.0	80.0
Exports.....	5,677.0	5,150.0	5,114.0	1,489.0	2,476.0	2,034.0	3,230.0
Residual.....	6,926.3	9,622.5	14,593.7	2,559.4	28,502.3	9,272.6	49,386.1
	1967	1968	1969	1970	1971	1972	1973
Supply.....	79,511.0	95,098.0	80,334.0	101,891.0	101,148.0	91,474.0	125,409.0
Domestic production.....	77,419.0	93,393.0	79,917.0	99,731.0	98,760.0	85,993.0	109,784.0
Imports.....	2,122.0	1,705.0	417.0	2,160.0	2,688.0	8,481.0	15,625.0
Consumption.....	62,532.3	63,380.4	61,226.0	65,314.7	68,783.9	65,563.4	67,659.6
Seed.....	14,768.3	15,234.4	14,427.0	13,885.7	13,429.9	13,244.4	11,812.6
Food.....	41,511.0	42,438.6	41,402.0	41,902.0	46,055.0	47,087.0	46,962.0
Flour.....	41,260.0	42,170.0	42,130.0	41,610.0	45,740.0	46,800.0	46,640.0
Grouts.....	251.0	268.0	272.0	292.0	315.0	287.0	322.0
Industry.....	445.0	524.0	596.0	756.0	800.0	820.0	840.0
Alcohol.....	445.0	524.0	596.0	756.0	800.0	820.0	840.0
Exports.....	5,808.0	5,137.0	6,801.0	5,771.0	8,508.0	1,445.0	5,045.0
Residual.....	17,008.7	31,717.9	16,108.0	36,579.3	32,664.1	28,910.6	57,749.4

Table A-3

USSR: Supply and Consumption of Rye

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	16,357.0	16,716.0	17,024.0	11,886.0	13,626.0	16,235.0	13,153.0
Domestic production.....	16,357.0	16,716.0	17,024.0	11,878.0	13,619.0	16,228.0	13,146.0
Imports.....	.....	.....	.....	8.0	7.0	7.0	7.0
Consumption.....	12,714.8	13,275.6	15,811.0	13,550.8	11,706.0	10,798.2	12,236.8
Seed.....	3,668.8	3,688.0	4,013.0	3,992.8	3,854.0	3,261.2	3,017.8
Food.....	8,260.0	8,910.0	9,880.0	8,410.0	7,630.0	7,420.0	8,840.0
Flour.....	8,260.0	8,910.0	9,880.0	8,410.0	7,630.0	7,420.0	8,840.0
Industry.....	104.0	89.0	618.0	348.0	75.0	80.0	104.0
Alcohol.....	104.0	89.0	618.0	348.0	75.0	80.0	104.0
Exports.....	682.0	1,088.0	1,300.0	800.0	150.0	37.0	275.0
Residual.....	3,642.2	2,940.4	1,213.0	1,664.8	1,920.0	5,436.8	916.2
	1967	1968	1969	1970	1971	1972	1973
Supply.....	12,986.0	14,120.0	10,945.0	12,372.0	12,787.0	9,733.0	12,059.0
Domestic production.....	12,986.0	14,120.0	10,945.0	12,372.0	12,787.0	9,633.0	10,759.0
Imports.....	.....	.....	.....	.....	.....	100.0	1,300.0
Consumption.....	11,990.4	10,824.4	10,562.8	10,685.2	10,830.6	9,970.8	10,700.0
Seed.....	3,004.4	2,837.4	2,499.8	2,479.2	2,335.6	1,488.8	1,920.0
Food.....	8,550.0	7,690.0	7,770.0	8,230.0	8,180.0	8,370.0	8,650.0
Flour.....	8,550.0	7,690.0	7,770.0	8,230.0	8,180.0	8,370.0	8,650.0
Industry.....	100.0	68.0	69.0	99.0	104.0	112.0	130.0
Alcohol.....	100.0	68.0	69.0	99.0	104.0	112.0	130.0
Exports.....	336.0	229.0	224.0	177.0	211.0	.....	.....
Residual.....	995.6	3,295.6	382.2	2,286.8	1,956.4	237.8	1,359.0

Table A-4

USSR: Supply and Consumption of Buckwheat

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	639.0	867.0	871.0	498.0	711.0	950.0	935.0
Domestic production.....	639.0	867.0	871.0	498.0	711.0	950.0	935.0
Consumption.....	353.1	461.7	505.4	422.3	544.4	464.4	580.3
Seed.....	189.1	228.7	182.4	138.3	179.4	184.4	172.3
Food.....	153.0	219.0	304.0	268.0	326.0	250.0	393.0
Flour.....	109.0	100.0	100.0	100.0	120.0	120.0	120.0
Groats.....	53.0	119.0	204.0	168.0	206.0	130.0	273.0
Industry.....	11.0	14.0	19.0	16.0	39.0	21.0	21.0
Alcohol.....	11.0	14.0	19.0	16.0	39.0	21.0	21.0
Residual.....	285.9	405.3	365.6	75.7	166.6	185.6	348.7
	1967	1968	1969	1970	1971	1972	1973
Supply.....	1,175.0	1,472.0	1,375.0	1,081.0	1,170.0	811.0	1,301.0
Domestic production.....	1,175.0	1,472.0	1,375.0	1,081.0	1,170.0	811.0	1,301.0
Consumption.....	593.3	770.3	843.9	875.8	876.0	776.0	884.3
Seed.....	170.3	204.3	187.5	176.8	172.0	160.0	168.3
Food.....	394.0	540.0	630.0	680.0	680.0	592.0	692.0
Flour.....	120.0	140.0	140.0	140.0	140.0	100.0	140.0
Groats.....	274.0	400.0	490.0	540.0	540.0	492.0	552.0
Industry.....	20.0	20.0	20.0	19.0	24.0	24.0	24.0
Alcohol.....	20.0	20.0	20.0	19.0	24.0	24.0	24.0
Residual.....	581.7	701.7	531.1	205.2	294.0	35.0	419.7

Table A-5

USSR: Supply and Consumption of Rice

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	940.0	277.0	780.0	668.0	1,017.0	941.0	1,426.0
Domestic production.....	187.0	247.0	272.0	376.0	471.0	583.0	712.0
Imports.....	753.0	30.0	508.0	292.0	546.0	358.0	714.0
Consumption.....	968.0	620.5	487.0	656.0	883.1	724.5	773.4
Seed.....	24.0	24.0	24.0	48.0	52.1	59.5	67.4
Food.....	920.0	595.0	442.0	585.0	825.0	660.0	700.0
Groats.....	920.0	595.0	442.0	585.0	825.0	660.0	700.0
Exports.....	24.0	1.5	21.0	23.0	6.0	5.0	6.0
Residual.....	28.0	343.5	293.0	12.0	133.9	216.5	352.6
	1967	1968	1969	1970	1971	1972	1973
Supply.....	1,492.0	1,454.0	1,597.0	1,765.0	1,929.0	2,068.0	1,997.0
Domestic production.....	895.0	1,063.0	1,107.0	1,279.0	1,430.0	1,647.0	1,765.0
Imports.....	597.0	391.0	490.0	486.0	499.0	421.0	232.0
Consumption.....	908.9	1,056.7	1,134.0	1,207.6	1,235.0	1,146.4	1,268.8
Seed.....	74.9	78.7	84.0	93.6	101.0	110.4	118.8
Food.....	828.0	972.0	1,042.0	1,102.0	1,125.0	1,025.0	1,150.0
Groats.....	828.0	972.0	1,042.0	1,102.0	1,125.0	1,025.0	1,150.0
Exports.....	6.0	6.0	8.0	12.0	9.0	11.0	....
Residual.....	583.1	397.3	463.0	557.4	694.0	921.6	728.2

USSR: Supply and Consumption of Corn

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	9,940.0	17,136.0	15,474.0	11,143.0	13,849.0	8,030.0	8,590.0
Domestic production.....	9,823.0	17,113.0	15,474.0	11,143.0	13,849.0	8,030.0	8,410.0
Imports.....	117.0	21.0	0.0	0.0	0.0	0.0	180.0
Consumption.....	1,378.2	2,307.8	3,267.4	2,589.1	2,910.0	2,464.1	1,985.8
Seed.....	812.2	1,215.8	1,112.4	808.1	781.0	770.1	761.8
Food.....	233.0	327.0	361.0	385.0	676.0	448.0	562.0
Grains.....	233.0	327.0	361.0	385.0	676.0	448.0	562.0
Industry.....	211.0	419.0	537.0	583.0	820.0	695.0	485.0
Alcohol.....	8.0	129.0	253.0	300.0	412.0	200.0	36.0
Starch and syrup.....	203.0	290.0	284.0	283.0	408.0	495.0	449.0
Exports.....	122.0	406.0	1,257.0	723.0	639.0	551.0	174.0
Residual.....	8,561.8	14,768.2	12,289.0	9,553.0	10,939.0	5,565.9	6,591.2
	1967	1968	1969	1970	1971	1972	1973
Supply.....	9,520.0	9,092.0	12,452.0	9,732.0	9,478.0	13,930.0	18,010.0
Domestic production.....	9,163.0	8,828.0	11,951.0	9,428.0	8,597.0	9,830.0	13,210.0
Imports.....	357.0	264.0	498.0	304.0	881.0	4,100.0	5,400.0
Consumption.....	1,946.1	1,944.0	1,997.5	2,118.0	1,947.8	2,054.0	2,225.0
Seed.....	742.1	742.0	707.5	690.6	718.8	722.0	722.0
Food.....	524.0	442.0	494.0	518.0	495.0	451.0	506.0
Grains.....	524.0	442.0	494.0	518.0	495.0	451.0	506.0
Industry.....	515.0	551.0	539.0	620.0	616.0	632.0	632.0
Alcohol.....	28.0	29.0	22.0	36.0	22.0	32.0	32.0
Starch and syrup.....	487.0	522.0	517.0	584.0	594.0	600.0	600.0
Exports.....	165.0	209.0	247.0	281.0	118.0	249.0	365.0
Residual.....	7,573.9	7,148.0	10,464.5	7,613.4	7,530.2	11,876.0	16,291.0

Table A-7

USSR: Supply and Consumption of Oats

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	11,999.0	8,900.0	5,691.0	3,965.0	5,519.0	6,180.0	9,199.0
Domestic production.....	11,999.0	8,900.0	5,691.0	3,965.0	5,519.0	6,180.0	9,199.0
Consumption.....	2,711.0	1,903.0	1,446.0	1,350.0	1,502.6	1,523.4	1,791.6
Seed.....	2,300.0	1,380.0	1,140.0	1,140.0	1,325.6	1,432.4	1,737.6
Food.....	317.0	291.0	256.0	175.0	137.0	73.0	38.0
Grains.....	317.0	291.0	256.0	175.0	137.0	73.0	38.0
Industry.....	52.0	52.0	25.0	13.0	12.0	6.0	4.0
Alcohol.....	52.0	52.0	25.0	13.0	12.0	6.0	4.0
Exports.....	42.0	180.0	25.0	22.0	28.0	12.0	12.0
Residual.....	9,288.0	6,997.0	4,245.0	2,615.0	4,016.4	4,662.6	7,407.4
	1967	1968	1969	1970	1971	1972	1973
Supply.....	11,581.0	11,639.0	13,370.0	14,203.0	14,600.0	14,100.0	17,500.0
Domestic production.....	11,581.0	11,639.0	13,070.0	14,203.0	14,600.0	14,190.0	17,500.0
Consumption.....	1,868.6	2,012.0	2,034.0	2,112.0	2,472.0	2,564.0	2,670.2
Seed.....	1,799.6	1,860.0	1,850.0	1,920.0	2,280.0	2,380.0	2,455.2
Food.....	53.0	136.0	163.0	180.0	180.0	164.0	184.0
Grains.....	53.0	136.0	163.0	180.0	180.0	164.0	184.0
Industry.....	5.0	10.0	13.0	12.0	12.0	12.0	12.0
Alcohol.....	5.0	10.0	13.0	12.0	12.0	12.0	12.0
Exports.....	11.0	6.0	8.0	.....	.....	8.0	19.0
Residual.....	9,712.4	9,627.0	11,036.0	12,091.0	12,120.0	11,536.0	14,829.8

USSR: Supply and Consumption of Harley

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	16,043.0	13,338.0	19,549.0	19,804.0	28,597.0	20,304.0	27,879.0
Domestic production.....	16,021.0	13,338.0	19,549.0	19,804.0	28,597.0	20,304.0	27,879.0
Imports.....	22.0						
Consumption.....	3,934.0	5,341.0	5,871.4	6,299.2	6,643.4	7,647.4	5,958.2
Seed.....	2,741.0	3,275.0	4,244.4	4,393.2	4,004.4	3,939.4	3,581.2
Food.....	233.0	327.0	361.0	385.0	676.0	448.0	562.0
Groats.....	233.0	327.0	361.0	385.0	676.0	448.0	562.0
Industry.....	690.0	739.0	776.0	921.0	1,297.0	1,192.0	1,225.0
Alcohol.....	65.0	69.0	76.0	210.0	589.0	400.0	366.0
Beer.....	625.0	670.0	700.0	702.0	708.0	792.0	859.0
Exports.....	300.0	1,000.0	500.0	600.0	666.0	2,068.0	290.0
Residual.....	12,109.4	7,993.4	13,677.6	13,504.8	21,953.6	12,656.6	21,920.8
	1967	1968	1969	1970	1971	1972	1973
Supply.....	24,662.0	28,964.0	32,652.0	38,200.0	34,600.0	39,400.0	50,900.0
Domestic production.....	24,662.0	28,964.0	32,652.0	38,200.0	34,600.0	39,400.0	50,900.0
Imports.....						2,600.0	1,900.0
Consumption.....	6,026.2	6,776.4	6,752.6	6,598.8	8,004.8	8,186.0	8,587.6
Seed.....	3,943.2	4,594.4	4,324.6	4,357.8	5,542.8	5,899.0	6,201.6
Food.....	524.0	442.0	494.0	518.0	495.0	451.0	506.0
Groats.....	524.0	442.0	494.0	518.0	495.0	451.0	506.0
Industry.....	1,407.0	1,426.0	1,486.0	1,220.0	1,280.0	1,330.0	1,380.0
Alcohol.....	204.0	168.0	193.0	172.0	180.0	180.0	180.0
Beer.....	903.0	958.0	993.0	1,048.0	1,100.0	1,150.0	1,200.0
Exports.....	452.0	614.0	748.0	503.0	687.0	500.0	500.0
Residual.....	18,635.8	22,127.6	25,899.4	31,601.2	26,595.2	31,220.0	48,312.4

Table A-9

USSR: Supply and Consumption of Millet

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	3,230.0	2,887.0	2,783.0	1,835.0	3,485.0	2,205.0	3,101.0
Domestic production.....	3,230.0	2,887.0	2,783.0	1,835.0	3,485.0	2,205.0	3,101.0
Consumption.....	590.0	1,049.0	1,468.0	1,011.5	1,508.6	1,224.6	1,124.1
Seed.....	114.0	129.0	119.0	106.5	97.6	97.6	114.1
Food.....	448.0	892.0	1,324.0	885.0	1,376.0	1,104.0	987.0
Groats.....	448.0	892.0	1,324.0	885.0	1,376.0	1,104.0	987.0
Industry.....	28.0	28.0	25.0	20.0	35.0	23.0	23.0
Alcohol.....	28.0	28.0	25.0	20.0	35.0	23.0	23.0
Residual.....	2,640.0	1,838.0	1,315.0	823.5	1,976.4	980.4	1,976.9
	1967	1968	1969	1970	1971	1972	1973
Supply.....	3,218.0	2,660.0	3,289.0	2,100.0	2,043.0	2,123.0	1,416.0
Domestic production.....	3,218.0	2,660.0	3,289.0	2,100.0	2,043.0	2,123.0	1,416.0
Consumption.....	1,309.5	1,296.3	1,164.7	1,232.9	1,244.7	1,150.0	1,277.1
Seed.....	91.5	101.3	80.7	71.9	81.7	87.0	89.4
Food.....	1,178.0	1,148.0	1,042.0	1,125.0	1,125.0	1,025.0	1,150.9
Groats.....	1,178.0	1,148.0	1,042.0	1,125.0	1,125.0	1,025.0	1,150.0
Industry.....	40.0	47.0	42.0	36.0	38.0	38.0	38.0
Alcohol.....	40.0	47.0	42.0	36.0	38.0	38.0	38.0
Residual.....	1,908.5	1,363.7	2,124.3	867.1	798.3	973.0	3,138.9

Table A-10

USSR: Supply and Consumption of Pulses

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	2,700.0	4,050.0	7,003.0	8,046.0	11,112.0	6,096.0	7,040.0
Domestic production.....	2,700.0	4,030.0	7,579.0	8,029.0	11,110.0	6,089.0	7,031.0
Imports.....	...	20.0	24.0	17.0	2.0	7.0	9.0
Consumption.....	1,084.3	1,778.0	2,070.0	3,055.0	1,843.2	2,010.2	1,849.8
Seed.....	999.3	1,050.0	2,490.0	2,447.9	1,554.6	1,363.2	1,255.8
Food.....	74.0	107.0	152.0	574.0	229.0	90.0	130.0
Grains.....	74.0	107.0	152.0	574.0	229.0	90.0	130.0
Industry.....	11.0	15.0	18.0	10.0	40.0	21.0	21.0
Alcohol.....	11.0	15.0	18.0	10.0	40.0	21.0	21.0
Exports.....	...	...	10.0	18.0	20.0	530.0	443.0
Residual.....	1,621.7	2,278.0	4,920.1	4,990.1	9,268.4	4,085.8	5,190.2
	1967	1968	1969	1970	1971	1972	1973
Supply.....	6,550.0	7,212.0	7,840.0	7,019.0	6,948.0	7,103.0	8,447.0
Domestic production.....	6,550.0	7,212.0	7,840.0	7,019.0	6,948.0	7,103.0	8,447.0
Imports.....	...	...	...	...	...	...	...
Consumption.....	1,433.0	1,549.0	1,819.1	1,498.9	1,745.7	1,687.0	1,735.5
Seed.....	1,162.0	1,193.0	1,166.1	1,190.9	1,346.7	1,403.0	1,434.5
Food.....	167.0	192.0	205.0	225.0	225.0	205.0	230.0
Grains.....	167.0	192.0	205.0	225.0	225.0	205.0	230.0
Industry.....	28.0	20.0	20.0	18.0	24.0	24.0	24.0
Alcohol.....	28.0	20.0	20.0	18.0	24.0	24.0	24.0
Exports.....	70.0	138.0	422.0	65.0	150.0	55.0	47.0
Residual.....	5,117.0	5,663.0	6,020.9	6,120.1	5,202.3	5,416.0	6,711.5

Table A-11

USSR: Supply and Consumption of Other Grains

Thousand Metric Tons

	1960	1961	1962	1963	1964	1965	1966
Supply.....	300.0	300.0	100.0	200.0	200.0	200.0	100.0
Domestic production.....	300.0	300.0	100.0	200.0	200.0	200.0	100.0
Consumption.....	30.7	47.0	60.5	47.6	31.4	29.1	23.0
Seed.....	30.7	47.0	60.5	47.6	31.4	29.1	23.0
Residual.....	269.3	253.0	39.5	152.4	168.6	170.9	77.0
	1967	1968	1969	1970	1971	1972	1973
Supply.....	100.0	...	100.0	179.0	240.0	198.0	339.0
Domestic production.....	100.0	...	100.0	179.0	240.0	198.0	339.0
Consumption.....	21.6	21.7	16.9	18.2	24.4	33.6	27.7
Seed.....	21.6	21.7	16.9	18.2	24.4	33.6	27.7
Residual.....	78.4	-21.7	83.1	160.8	215.6	164.4	311.3

1. *Supply*—equals the sum of domestic production plus imports.
2. *Domestic production*—data are reported in the annual statistical handbook. For 1973, for example, see USSR, Central Statistical Administration (hereafter TsSU), *Narodnoye khozyaystvo SSSR v 1973 godu* (hereafter *Narkhoz* and the appropriate year), Moscow, 1974, p. 394, for total grain and subsequent pages for grain by type.
3. *Imports*—data on imports of grain, flour, and groats are reported in the annual foreign trade handbook. For 1973, for example, see USSR, Ministry of Foreign Trade, *Vneshnyaya torgovlya SSSR za 1973 god* (hereafter *Vnesh. torg.*), Moscow, 1974, p. 46-47. Flour is converted to grain using the standard 72% milling rate. With the exception of 1963-66, when small quantities of rye flour (5,000-6,000 tons annually) were imported, the USSR has imported only wheat flour. Rice, the major groat product imported, is converted to grain using the standard 66.5% milling rate (USDA, ERS, Statistical Bulletin No. 362, *Conversion Factors and Weights and Measures*, June 1965, p. 35). Small quantities of pulses are also imported; no conversion factor is necessary (*Ibid.*, p. 27-28). Imports (and exports) include grain of foreign origin acquired by Soviet foreign trade organizations abroad and exported to other countries without shipment to the USSR.
4. *Consumption*—For Table A-1, equals the sum of uses for seed, food, industry, exports, and livestock feed. For Tables A-2 to A-11, equals sum of uses for seed, food, industry, and exports. (The use of grain for feed cannot be allocated by individual grain.)
5. *Seed*—estimates are made on the basis of official data on area sown to each grain and on seeding rate norms by grain by oblast for the RSFSR, Belorussia, and Moldavia—almost two-thirds of the USSR's grain area. In turn, the rates were assumed to be applicable for contiguous grain-growing areas. These estimates are then used to derive a nationwide seeding average. All rates are based on sowing "first class" seed with a purity of not less than 99% (for most grains) and a viability of not less than 95%. Data on area sown to each grain are reported in the annual statistical abstract, with one exception. (For 1973, for example, see *Narkhoz* 1973, p. 384 and subsequent pages.) The exception concerns winter grains; an estimate of the area winterkilled and requiring reseedling is made, based on current reports of weather-related problems. Sources for seeding rates are:

RSFSR—G. V. Kulik, *et al. Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, p. 424-425.

Moldavia—F. Goryachenko, *Spravochnik ekonomista po planirovaniyu v kolkhozakh i sovkhovakh*, Kishinev, 1967, p. 188-189.

Belorussia—I. M. Kachuro, *et al.* (compilers). *Normativnye materialy po sel'skomu khozyaystvu*, Minsk, 1969, p. 46-48.

The quantity of seed for each year is that quantity required to plant the crop of the following year.

6. *Food*—estimates are the sum of grain required to produce flour and groats.¹

¹ Although questioned by Western analysts in the past, the bulk of evidence indicates that reported flour production does not include groats production. See, for example, TsSU, *Promyshlennost' SSSR*, Moscow, 1964, p. 450, and A. N. Rukosuyev, *Tovarovedeniye zernomuchnykh i khlebynykh tovarov*, Moscow, 1973, p. 114, 263, 287.

quantity of flour produced from buckwheat is small. Total flour production is reported in the annual statistical handbook. (For 1973, for example, see *Narkhoz* 1973, p. 323.) The quantity of grain required to produce wheat and rye flour is estimated on the basis of the annual average milling rates. The milling or extraction rate is applied to "standard condition" (procured) grain. The quantity of grain required thus may be overstated or understated. For example, flour yields in Canada vary by as much as two and one-half percentage points, depending upon the stage at which the extraction rate is measured.² Milling rates—the amount of flour derived from a unit of grain—for the various grades of flour produced can be found in Ya. M. Zhislin and A. K. Tereshchenko, *Vyrabotka muki i krupy v sel'skokhozyaystvennom mykomoŭye*, Moscow, 1969, p. 227. The various types and qualities of flour milled for 1960, 1962, 1963, 1965-69 are found in TsSU, *Sovetskaya torgovlya*, Moscow, 1964, p. 98, and the monthly TsSU journal, *Vestnik statistiki*, no. 12, 1970, p. 85. Production shares and extraction rates for the years 1961 and 1971-73 for which these data are not available are estimated on the basis of reported data on production of *sortovoy* (quality or graded) flour. The estimated milling rates are:

	Wheat	Rye
1960	80.7	90.8
1961	80.6	90.4
1962	80.4	90.0
1963	84.4	90.8
1964	83.1	90.7
1965	81.9	90.6
1966	80.7	89.8
1967	80.0	88.8
1968	79.4	87.3
1969	78.9	87.0
1970	78.8	86.9
1971	78.5	86.7
1972	78.5	86.7
1973	78.3	86.5

8. *Groats*—production for the early 1960s is found in TsSU, *Promyshlennost' SSSR*, Moscow, 1964, p. 450. Data for most subsequent years are reported in the technical press. (For 1970, for example, see *Zakupki sel'skokhozyaystvennykh produktov*, no. 1, 1970, p. 5.) Data on the share of groats milled from each type of grain are used to distribute groats production among the grains. These data are available for the same years and from the same sources as the flour milling data. Estimates for other years are made by interpolation. The quantity of grain required is estimated on the basis of the official food industry norms for conversion of groats to grain from N. V. Vinogradov, *Ekonomika pishchevoy promyshlennosti SSSR*, Moscow, 1968, p. 279.

9. *Industry*—estimated as the sum of grain used to produce alcohol, beer, and starch and syrup.

10. *Alcohol*—data for 1960-70 on the amount of grain used in alcohol production are found in V. G. Pykhov, *Ekonomika, organizatsiya i planirovaniye spirtovogo proizvodstva*, Moscow, 1966, p. 27, and 1973, p. 29. Estimates for

² At the flour mill, extraction rates can be calculated on the basis of (1) uncleaned wheat received through the weigher; (2) clean, unwashed wheat; (3) clean wheat weighed at the first break; and (4) clean wheat products. We assume the rates are applied to uncleaned wheat received through the weigher.

1971-73 are based on the estimated share of alcohol produced from grain (based on the trend as found in V. P. Zotov, *et. al.*, *Pishchevaya promyshlennost' SSSR*, Moscow, 1967, p. 401, and V. M. Shvartz, *Organizatsiya upravleniya v pishchevay promyshlennosti SSSR*, Moscow, 1966, p. 41). The official food industry norm for converting grain to alcohol is from V. P. Zotov, *Pishchevaya promyshlennost' sovetskogo soyuza*, Moscow, 1958, p. 111. Distribution by type of grain is made according to the average reported shares in 1969 and 1970 (Pykhov, *op. cit.*, 1973, p. 29).

11. *Beer*—the estimated amount of barley used in industrial beer production (the only grain used) is based on the annual production of beer, reported in the statistical handbook (for 1973, see *Narkhoz* 1973, p. 323) and the official food industry norm for the conversion of barley to beer (Vinogradov, *op. cit.* p. 280).

12. *Starch and syrup*—data on the share of starch and syrup produced from corn are available for only a few years since 1960, from V. P. Zotov, *et. al.*, *Pishchevaya promyshlennost' SSSR*, Moscow 1967, p. 360. Estimates for other years are interpolated. Food industry norms for conversion of corn to starch and syrup are used to estimate the quantity of corn used (*Ibid.*, p. 366).

13. *Exports*—data on exports of grain (by type), flour, groats, and pulses, are reported in the annual foreign trade handbook. (For 1973, for example, see *Vnesh. torg.* 1973, p. 32-33.) Neither flour nor groats is given by type of grain. The balance assumes that exported flour is wheat flour (because the Soviet press frequently complains of shortages of rye flour). No distribution of exported groats by type of grain is attempted, although there is some evidence (based on export values) that as much as one-half may be rice. Exported groats, converted to grain using the food industry norm, enter the balance only in Table A-1, the total grain balance. Because the quantity exported is small—less than 50,000 tons in most years—the effect on the individual balances probably is slight. Exports (and imports) include grain of foreign origin acquired by Soviet foreign trade organizations abroad and exported to other countries without shipment to the USSR.

14. *Residual*—in Tables A-2 through A-11, the difference between "Supply" and "Consumption."

15. *Livestock feed*—in Table A-1, is derived from officially reported data on the consumption of feed concentrates (see Appendix B).

APPENDIX B

Derivation of Grain Fed to Livestock

The estimates of grain fed to livestock are derived by subtracting estimated quantities of other feed concentrates fed from officially reported quantities of total feed concentrates fed, which are regularly published (see Table B-1). Estimates of the amount of milling by-products and oilseed meal are presented in Tables B-2 and B-3. The quantity of alfalfa meal—one of two remaining categories of feed concentrates fed (Soviet definition)—is given for 6 years (see Table B-1) and extended on the basis of past trends. No estimate of the dried residues of the starch, beet sugar, and distilling industries fed as concentrates is included.

Table B-1

USSR: Derivation of Grain Fed to Livestock

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Million Metric Tons														
Total concentrates ¹ . . .	53.7	59.3	61.4	52.3	48.2	65.3	70.5	75.1	80.3	89.5	103.2	109.7	109.6	117.0
Grain ²	43.68	48.82	50.29	42.61	37.66	53.83	57.90	61.57	66.12	74.86	87.90	93.45	92.83	99.20
Milling byproducts ³ . . .	8.22	8.43	8.03	7.16	7.85	8.43	9.28	9.76	10.27	10.58	11.26	11.61	11.66	11.95
Oilseed meal ⁴	1.80	2.08	2.48	2.53	2.70	2.96	3.13	3.45	3.47	3.49	3.13	....	....	....
Calculated ⁵ . . . . .	....	....	....	....	....	....	....	....	3.27	3.12	3.06	3.38	3.46	3.73
Alfalfa meal ⁴ . . . . .	....	....	....	....	....	0.08 ¹	0.18	0.31	0.44	0.57	0.91	1.26 ⁶	1.66 ⁶	2.08 ⁶
Percent														
Grain as a share of total concentrates	81	82	82	81	78	82	82	82	82	84	85	85	85	85

¹ *Narkhoz 1973*, p. 454; *Narkhoz 1969*, p. 385; *Narkhoz 1967*, p. 451; *Narkhoz 1964*, p. 377; and *Narkhoz 1961*, p. 410.

² Total concentrates less milling byproducts, oilseed meal, and alfalfa meal.

³ Appendix B, Table B-2. According to *Ekonomika sel'skogo khozyaystva* (hereafter *ESK*), no. 4, 1971, p. 28, 92% of milling byproducts are used as feed.

⁴ US livestock delegation to the USSR, October 1971 (hereafter *USLD*).

⁵ Appendix B, Table B-3. According to *ESK*, no. 4, 1971, p. 28, 75% of the total output of meat is used as feed. The close agreement noted between the reported and the calculated oilseed for 1968-70 lends credibility to the methodology.

⁶ Estimate based on trend in annual increments to production.

Table B-2

USSR: Derivation of Milling Byproducts Available for Livestock Feed

Million Metric Tons

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total	8.93	9.16	9.38	7.78	8.53	9.16	10.09	10.61	11.16	11.50	12.24	12.62	12.67	12.99
Wheat flour ¹	7.17	7.21	7.00	5.01	6.12	7.16	7.88	8.25	8.08	8.80	9.46	9.84	10.06	10.12
Rye flour ¹	0.70	0.85	0.99	0.77	0.71	0.70	0.91	0.96	0.98	1.01	1.08	1.08	1.11	1.17
Groats ²	1.00	1.10	1.30	1.40	1.70	1.30	1.30	1.40	1.50	1.60	1.70	1.70	1.50	1.70

¹ The difference between quantity of flour produced and the quantity of grain required to produce the flour (see Appendix A). The amount of byproducts from production of flours other than wheat and rye is insignificant.

² The difference between the quantity of groats produced and the quantity of grain required to produce them (see Appendix A).

Table B-3

USSR: Oilseeds Processed for Vegetable Oils and Meals

	Million Metric Tons of Seed ¹						Million Metric Tons of Meal Produced ²					
	1968 ³	1969	1970	1971	1972	1973 ⁴	1968	1969	1970	1971	1972	1973
Total	9.109	8.741	8.487	9.055	9.200	9.273	4.36	4.16	4.08	4.51	4.61	4.97
Sunflower seed ⁵	5.350	5.260	4.960	4.880	4.790	4.140	1.87	1.84	1.74	1.71	1.08	1.45
Cotton seed ⁵	2.950	2.730	3.040	3.490	3.810	3.880	1.93	1.83	2.04	2.34	2.55	2.60
Soybean ⁶	0.343	0.299	0.182	0.351	0.218	0.914	0.27	0.24	0.14	0.28	0.17	0.72
Flaxseed ⁶	0.208	0.214	0.122	0.140	0.162	0.160	0.13	0.14	0.08	0.09	0.10	0.10
Castor beans ⁶	0.065	0.066	0.053	0.047	0.048	....	Not used for animal feed					
Peanuts ⁶	0.018	0.012	0.010	0.002	0.030	0.005	0.01	0.01	0.01	....	0.02	....
Other ⁷	0.175	0.160	0.120	0.145	0.142	0.174	0.10	0.10	0.07	0.09	0.09	0.10

¹ Based on output of vegetable oil by type, 1963-72, from US/USSR information exchange materials, dated 6 March 1974.

² Following USDA, ERS Foreign 355, *Livestock Feed Balances for the USSR* (hereafter ERS Foreign 355), Table 8, p. 17.

³ ERS Foreign 355, Table 9, p. 18.

⁴ *Maslo-zhirovaya promyshlennost'*, No. 4, 1974, p. 28 (which presents production under the control of the Ministry of Vegetable Oil Industry only). Total output of sunflower oil is assumed to be 300,000 tons higher than Ministry output; all other types of vegetable oil production are assumed to be equal to Ministry output.

⁵ Extraction rates for sunflower and cotton seed oil from seed for 1969 to 1973 are based on average rates from *Norkhoz* 1970, p. 260; *Norkhoz* 1972, p. 271; and *Maslo-zhirovaya promyshlennost'*, No. 4, 1971, p. 29, 30, weighted by capacity from Zotov *et al.*, *op. cit.*, p. 251. It is assumed that the relationship of capacity by extraction type has not changed.

⁶ Extraction rates from ERS Foreign 355, p. 18.

⁷ Summation of production of jute, mustard, tung, and "other" oil.